WORKING
COPY

VERIF. DATE: _____

INTIALS: _____

CP2-ER-0046/FR2A

Paducah Plume Operations Maintenance, Sampling and Analysis, and Calibration and Testing Plan

This document is approved for public release per review by:

JACKIE THOMPSON (Affiliate)

Digitally signed by JACKIE THOMPSON (Affiliate)
Date: 2022.07.26 10:50:18 -05'00'

FRNP Classification Support Date

Paducah Plume Operations Maintenance, Sampling and Analysis, and Calibration and Testing Plan

Date Issued—July 2022

U.S. DEPARTMENT OF ENERGY
Office of Environmental Management

Prepared by
FOUR RIVERS NUCLEAR PARTNERSHIP, LLC,
managing the
Deactivation and Remediation Project at the
Paducah Gaseous Diffusion Plant
under Contract DE-EM0004895

THIS PAGE INTENTIONALLY LEFT BLANK

APPROVALS

**Paducah Plume Operations Maintenance,
Sampling and Analysis,
and Calibration and Testing Plan**

CP2-ER-0046/FR2A

July 2022

Approved by:

EDWARD JOHNSTONE (Affiliate) Digitally signed by EDWARD JOHNSTONE (Affiliate)
Date: 2022.07.27 06:38:00 -05'00'

E. F. Johnstone
Pump & Treat Operations Manager

Date

JOSEPH TARANTINO (Affiliate) Digitally signed by JOSEPH TARANTINO (Affiliate)
Date: 2022.07.27 09:28:33 -05'00'

Joe Tarantino
Environmental Remediation Manager

Date

BRUCE FORD (Affiliate) Digitally signed by BRUCE FORD (Affiliate)
Date: 2022.07.28 11:58:11 -05'00'

Bruce Ford
Environmental Services Director

Date

Effective Date: August 4, 2022

Required Review Date: July 28, 2025

Nuclear Safety Documentation: Non-Intent Change – N/A per CP3-NS-2001, Appendix A

THIS PAGE INTENTIONALLY LEFT BLANK

REVISION LOG

REVISION NUMBER	DATE	DESCRIPTION OF CHANGES	PAGES AFFECTED
FR0	10/20/17	Initial bluesheeted revision	All
FR1	11/28/17	Nonintent revision to incorporate bluesheeting changes	All
FR2	1/15/2020	Intent revision to incorporate changes from corrective action CA-002037	All
FR2A	7/28/2022	Nonintent revisions for clarity	2, D-11 through D-20

THIS PAGE INTENTIONALLY LEFT BLANK

CONTENTS

THIS PAGE INTENTIONALLY LEFT BLANK

TABLES

THIS PAGE INTENTIONALLY LEFT BLANK

ACRONYMS

EW	extraction well
NEPCS	Northeast Plume Containment System
NWPGS	Northwest Plume Groundwater System

THIS PAGE INTENTIONALLY LEFT BLANK

1. MAINTENANCE, SAMPLING AND ANALYSIS, AND CALIBRATION AND TESTING

Maintenance, sampling and analysis, and calibration and testing are performed on system components for both the Northwest Plume Groundwater System (NWPGS) and the Northeast Plume Containment System (NEPCS) in accordance with the manufacturers' instructions and best management practices. Maintenance, sampling and analysis, and calibration and testing are based on the *Operation and Maintenance Plan for the Northwest Plume Groundwater System* and the *Operation and Maintenance Plan for the Northeast Plume Containment System*. Maintenance, sampling and analysis, and calibration and testing activities are separated into three categories: (1) maintenance, (2) sampling and analysis, and (3) calibration and testing. Maintenance activities are those activities that require only routine checks or replacements. Sampling and analysis activities are required to support monitoring and laboratory testing of the facilities. Calibration and testing activities require more in-depth testing, which must meet set "pass/fail" criteria. Calibrations are performed using certified gauges, meters, and/or testing devices in accordance with manufacturer's instructions [American Society for Testing and Materials guidance, or other approved techniques]. Due to the large number of system components to be maintained, the workload is divided into monthly, quarterly, and annual checklists, as appropriate, with quarterly checklists based on calendar years. All checklists are controlled through this maintenance, calibration, and testing plan.

A maintenance task frequency table for the NEPCS is provided in Appendix A. The maintenance task frequency table lists the system components and describes the associated maintenance activities and frequencies. Form CP2-ER-0046-F22 has the corresponding annual maintenance checklist for the NEPCS. The calibration and testing assessment for the NEPCS can be found in Appendix B. This table describes the functional testing to be performed for each affected system component. The quarterly checklists corresponding to the NEPCS calibration and testing assessment are found on forms CP2-ER-0046-F23, CP2-ER-0046-F24, CP4-ER-0046-F25, and CP4-ER-0046-F26.

The maintenance task frequency table for the NWPGS is found in Appendix C. Form CP2-ER-0046-F27 has the corresponding monthly maintenance checklist for the NWPGS. Form CP2-ER-0046-F28 contains the NWPGS quarterly maintenance checklist, and form CP2-ER-0046-F29 contains the annual maintenance checklists. The calibration and testing assessment for the NWPGS can be found in Appendix D. The quarterly checklists corresponding to this assessment for the even years are in forms CP2-ER-0046-F30, CP2-ER-0046-F31, CP2-ER-0046-F32, and CP2-ER-0046-F33. The quarterly checklists for the odd years can be found in forms CP2-ER-0046-F34, CP2-ER-0046-F35, CP2-ER-0046-F36, and CP2-ER-0046-F37.

In the event that a system component does not pass a specified test or calibration requirement, a follow-up testing form (CP2-ER-0046-F38) will be completed once the system component is repaired, replaced, or adjusted to meet the testing requirements.

Three of the four alarm conditions associated with the auto dialer call-out features are tested quarterly either as an individual test or as part of an associated component's test. The fourth one is tested semiannually when online analyzer detects effluent with > 25 ppb trichloroethene (TCE). System pressure gauges and flow meters are tested and/or calibrated (if necessary). Equipment and instrumentation testing and calibration will be conducted using actual operating conditions whenever possible. When testing under actual operating conditions is unsafe, impractical, or impossible, a signal generator or some other manufacturer-recommended technique will be used. Maintenance and calibration forms will be completed each time activities are performed.

The TCE online analyzer at the C-612 facility will be calibrated semiannually, unless the check standard multiplier is found to be out of range, as specified by the manufacturer. In addition, continuing calibration check standards will be analyzed quarterly. Calibration check standards will be considered acceptable if the results are within 30% of the true spike value. Corrective action will include system evaluation, reanalysis and/or recalibration, if appropriate.

Activities not included in this plan are the daily operational checks. These are detailed in CP4-ER-0017, *Daily NWNEP Operational Data Collection and Maintenance Sheets*, and are performed on specified equipment and recorded on the daily operational data collection and maintenance form, CP4-ER-0017-F02.

Any system component not used in the current system configuration will be placed out of service with an out-of-service tag. If possible, all out-of-service items will be collected and stored in a common location.

2. DESCRIPTION OF MONITORING AND LABORATORY TESTING

Groundwater and process monitoring is conducted to ensure proper facility operation and compliance with the Record of Decision for the NWPGS and the NEPCS. The data quality objective process is used to ensure collection of data meets the appropriate quality and quantity to meet the NWPGS and NEPCS objectives. The sampling and laboratory testing for the environmental monitoring wells listed in the Operations and Maintenance Plans for the NWPGS and NEPCS will be documented in the Environmental Monitoring Plan. Tables 1 and 2 describe the process monitoring of the NWPGS and the NEPCS, respectively.

Table 1. Summary of Sampling, Analysis, and Data Collection for the NWPGS

Sampling Point(s)	Parameters	Frequency
Extraction Wells (EWs) EW232 and EW233 (EW230 and EW231 if returned to service)	Pump Rates Water Levels TCE, technetium-99 (Tc-99), Gross Alpha/Beta	Daily Weekly Quarterly
System Influent	TCE Tc-99 Silicon, Iron, Manganese, volatile organic compounds Calcium Hardness Sulfates, Alkalinity	Monthly Monthly Quarterly Quarterly Quarterly Semiannually
System Effluent	TCE Tc-99	Weekly Weekly
Air Stripper Liquid Effluent	Tc-99	Monthly
System Ion Exchange units	Tc-99	Monthly

Table 2. Summary of Sampling, Analysis, and Data Collection for the NEPCS

Sampling Point(s)	Parameters	Frequency
EW234 and EW235	Pump Rates	Daily
	Water Levels	Weekly
	TCE, Tc-99	Monthly
Air Stripper Liquid Effluent	TCE	Weekly
Comprehensive Environmental Response, Compensation, and Liability Outfall	Flow, Total Suspended Solids, Oil and Grease, Total Residual Chlorine, Temperature, TCE	Weekly
	Chronic Toxicity, Tc-99*	Quarterly
	pH	Weekly
	1,1- Dichloroethylene	Weekly

*Quarterly sampling for Tc-99 at C001 is required by the Remedial Action Work Plan.

3. MEASUREMENT AND TEST EQUIPMENT

Measurement and test equipment used in performance of this maintenance, calibration, and testing plan shall be handled in accordance with CP3-SM-0017, *Measuring and Test Equipment Program*, and CP4-ER-0020, *Control and Use of Measuring Test Equipment for the Northwest and Northeast Plume Operations*, and CP3-SM-0049, *Installed Plant Instrumentation Measuring and Test Equipment*, as applicable.

4. TIME INTERVALS FOR MAINTENANCE, CALIBRATION, AND TESTING ACTIVITIES

The minimum and maximum time intervals (grace period) for activities are intended to accommodate operational and maintenance scheduling. Maintenance, calibration, and testing activities should not be conducted routinely on or outside the minimum and/or grace period. Grace periods are documented and maintained in the computerized maintenance management system (currently SOMAX).

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A

MAINTENANCE TASK FREQUENCY TABLE FOR NEPCS

THIS PAGE INTENTIONALLY LEFT BLANK

Northeast Plume Containment System Maintenance Task Frequency			
P&ID	**Location**	**Task**	**Frequency**
N/A	Well Vaults (EW234 & EW235)	Lubricate vault door hinges	Annually
PLC	Equipment Pad (C-765 & C-765-A)	Change the lithium batteries*	Biennially
Auto-Dialer	Equipment Pad (C-765 & C-765-A)	Change the lithium batteries*	Biennially
VFD Cabinet	EW234 & EW235	Change Batteries*	Biennially
Cellular Modem	Equipment Pad (C-765 & C-765-A)	Change the lithium batteries*	Biennially
Air Compressor	Equipment Pad (C-765 & C-765-A)	Drain condensate from air compressor tank	Quarterly
Air Compressor	Equipment Pad (C-765 & C-765-A)	Drain and replace oil in air compressor	Annually
Air Compressor	Equipment Pad (C-765 & C-765-A)	Replace oil mist separator (Performed in third quarter)	Biennially
B-340	Equipment Pad (C-765 & C-765-A)	Lubricate bearing on air stripper blower	Quarterly
Air Stripper Pump	Equipment Pad (C-765 & C-765-A)	Lubricate discharge pump motor	Quarterly
B-340	Equipment Pad (C-765 & C-765-A)	Inspect blower fan (Performed in third quarter)	Biennially

*Ensure lithium battery is disposed of properly per CP2-ER-0012, *Paducah Plume Operations Waste Management Plan*.
N/A = not applicable
PLC = programmable logic controller

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX B

CALIBRATION AND TESTING ASSESSMENT FOR NEPCS

THIS PAGE INTENTIONALLY LEFT BLANK

NEPCS Calibration and Testing Assessment

Device Number	Description	Equipment Location	Ver./Cal. Req?	Ver./Cal. Frequency	Task Description	C-765/EW234 Acceptance Criteria	C-765-A/EW235 Acceptance Criteria	Notes
N/A	Programmable Logic Controller (PLC)	C-765 C-765-A	Yes	Annual	Turn off main disconnect at treatment unit (TU) to interrupt power to the PLC.	Shutdown EW, obtain alarm on C-765 HMI and receive autodialer callout.	Shutdown EW, obtain alarm on C-765-A HMI and receive autodialer callout.	None
N/A	POINT I/O EtherNet/IP Adapter	EW-234 EW-235	Yes	Annual	Turn off main disconnect at extraction well (EW) to interrupt communication with TU.	Obtain alarm on C-765 HMI and receive autodialer callout.	Obtain alarm on C-765-A HMI and receive autodialer callout.	None
LT-270	EW Level Transmitter	EW-234 EW-235	Yes	Annual	2-point check using manual water level meter.	Readings should be within ±0.5 ft of manual water level reading.	Readings should be within ±0.5 ft of manual water level reading.	None
				Quarterly	Inspect desiccant pack.	Desiccant pack acceptable for continued use per manufacturer's specification.	Desiccant pack acceptable for continued use per manufacturer's specification.	Replace desiccant pack as required per manufacturer's specification. Increase inspection frequency as atmospheric conditions warrant.
FIT-234	EW Effluent Flow Meter	EW-234	No	N/A	N/A	N/A	N/A	Cannot be calibrated. Flow rates and totals are collected during daily operations. Flow rates and totals outside of normal operating ranges are an indicator of flow meter/totalizer failure. Flow meter/totalizer will be checked if unusual readings are noted during data collection. Flow meter/totalizer will be replaced if the inspection indicates problems.
FIT-235	EW Effluent Flow Meter	EW-235	No	N/A	N/A	N/A	N/A	Cannot be calibrated. Flow rates and totals are collected during daily operations. Flow rates and totals outside of normal operating ranges are an indicator of flow meter/totalizer failure. Flow meter/totalizer will be checked if unusual readings are noted during data collection. Flow meter/totalizer will be replaced if the inspection indicates problems.
LSHH-280	EW Sump High-High Level Switch	EW-234 EW-235	Yes	Annual	Turn EW vault sump OFF and manually trip High-High Level Switch.	Obtain alarm on C-765 HMI and receive autodialer callout.	Obtain alarm on C-765-A HMI and receive autodialer callout.	Alarm delay is programmed in the PLC. LSHH-280 will not instantaneously alarm.

NEPCS Calibration and Testing Assessment (Continued)

Device Number	Description	Equipment Location	Ver./Cal. Req?	Ver./Cal. Frequency	Task Description	C-765/EW234 Acceptance Criteria	C-765-A/EW235 Acceptance Criteria	Notes
LSH-280	EW Sump High Level Switch	EW-234 EW-235	Yes	Annual	Turn EW vault sump in AUTO, add water, and verify High Level Switch turns on EW sump pump.	Ensure proper function	Ensure proper function	LSH-280 and LSL-280 are tested together.
LSL-280	EW Sump Low Level Switch	EW-234 EW-235	Yes	Annual	Turn EW vault sump in AUTO, add water, and verify Low Level Switch turns off EW sump pump.	Ensure proper function	Ensure proper function	LSH-280 and LSL-280 are tested together.
PI-290	Pressure Gauge	EW-234 EW-235	Yes	Annual	Check Calibration	Test Point 1: 0 psig + 1 psi Test Point 2: 50 psig ± 3 psi Test Point 3: 100 psig ± 3 psi Test Point 4: 150 psig ± 3 psi Test Point 5: 190 psig ± 3 psi	Test Point 1: 0 psig + 1 psi Test Point 2: 50 psig ± 3 psi Test Point 3: 100 psig ± 3 psi Test Point 4: 150 psig ± 3 psi Test Point 5: 190 psig ± 3 psi	None
PI-1	Pressure Gauge	C-765 C-765-A	Yes	Biennially	Shutdown system, bleed pressure, and check for zero shift. Remove pressure gauge for testing if necessary.	Zero shift less than 5 psig.	Zero shift less than 5 psig.	Instrument is NOT required/relied on for process monitoring or data collection through procedure, surveillance, or other performance documents. Instrument provides "Information Only" data. Instrument should be tagged as "Information Only" or with similar wording to indicate data from this instrument is not to be used for data collection or process monitoring. Instrument is not required to be calibrated, but at a minimum should be checked for proper function.
PI-2	Pressure Gauge	C-765 C-765-A	Yes	Biennially	Shutdown system, bleed pressure, and check for zero shift. Remove pressure gauge for testing if necessary.	Zero shift less than 5 psig.	Zero shift less than 5 psig.	Instrument is NOT required/relied on for process monitoring or data collection through procedure, surveillance, or other performance documents. Instrument provides "Information Only" data. Instrument should be tagged as "Information Only" or with similar wording to indicate data from this instrument is not to be used for data collection or process monitoring. Instrument is not required to be calibrated, but at a minimum should be checked for proper function.

NEPCS Calibration and Testing Assessment (Continued)

Device Number	Description	Equipment Location	Ver./Cal. Req?	Ver./Cal. Frequency	Task Description	C-765/EW234 Acceptance Criteria	C-765-A/EW235 Acceptance Criteria	Notes
PI-3	Pressure Gauge	C-765 C-765-A	Yes	Biennially	Shutdown system, bleed pressure, and check for zero shift. Remove pressure gauge for testing if necessary.	Zero shift less than 5 psig.	Zero shift less than 5 psig.	Instrument is NOT required/relied on for process monitoring or data collection through procedure, surveillance, or other performance documents. Instrument provides "Information Only" data. Instrument should be tagged as "Information Only" or with similar wording to indicate data from this instrument is not to be used for data collection or process monitoring. Instrument is not required to be calibrated, but at a minimum should be checked for proper function.
PI-4	Pressure Gauge	C-765 C-765-A	Yes	Biennially	Shutdown system, bleed pressure, and check for zero shift. Remove pressure gauge for testing if necessary.	Zero shift less than 5 psig.	Zero shift less than 5 psig.	Instrument is NOT required/relied on for process monitoring or data collection through procedure, surveillance, or other performance documents. Instrument provides "Information Only" data. Instrument should be tagged as "Information Only" or with similar wording to indicate data from this instrument is not to be used for data collection or process monitoring. Instrument is not required to be calibrated, but at a minimum should be checked for proper function.
PI-5	Pressure Gauge	C-765 C-765-A	Yes	Biennially	Shutdown system, bleed pressure, and check for zero shift. Remove pressure gauge for testing if necessary.	Zero shift less than 5 psig.	Zero shift less than 5 psig.	Instrument is NOT required/relied on for process monitoring or data collection through procedure, surveillance, or other performance documents. Instrument provides "Information Only" data. Instrument should be tagged as "Information Only" or with similar wording to indicate data from this instrument is not to be used for data collection or process monitoring. Instrument is not required to be calibrated, but at a minimum should be checked for proper function.

NEPCS Calibration and Testing Assessment (Continued)

Device Number	Description	Equipment Location	Ver./Cal. Req?	Ver./Cal. Frequency	Task Description	C-765/EW234 Acceptance Criteria	C-765-A/EW235 Acceptance Criteria	Notes
PI-6	Pressure Gauge	C-765 C-765-A	Yes	Biennially	Shutdown system, bleed pressure, and check for zero shift. Remove pressure gauge for testing if necessary.	Zero shift less than 5 psig.	Zero shift less than 5 psig.	Instrument is NOT required/relied on for process monitoring or data collection through procedure, surveillance, or other performance documents. Instrument provides "Information Only" data. Instrument should be tagged as "Information Only" or with similar wording to indicate data from this instrument is not to be used for data collection or process monitoring. Instrument is not required to be calibrated, but at a minimum should be checked for proper function.
PI-7	Pressure Gauge	C-765 C-765-A	Yes	Biennially	Shutdown system, bleed pressure, and check for zero shift. Remove pressure gauge for testing if necessary.	Zero shift less than 5 psig.	Zero shift less than 5 psig.	Instrument is NOT required/relied on for process monitoring or data collection through procedure, surveillance, or other performance documents. Instrument provides "Information Only" data. Instrument should be tagged as "Information Only" or with similar wording to indicate data from this instrument is not to be used for data collection or process monitoring. Instrument is not required to be calibrated, but at a minimum should be checked for proper function.
PI-8	Pressure Gauge	C-765 C-765-A	Yes	Biennially	Shutdown system, bleed pressure, and check for zero shift. Remove pressure gauge for testing if necessary.	Zero shift less than 5 psig.	Zero shift less than 5 psig.	Instrument is NOT required/relied on for process monitoring or data collection through procedure, surveillance, or other performance documents. Instrument provides "Information Only" data. Instrument should be tagged as "Information Only" or with similar wording to indicate data from this instrument is not to be used for data collection or process monitoring. Instrument is not required to be calibrated, but at a minimum should be checked for proper function.

NEPCS Calibration and Testing Assessment (Continued)

Device Number	Description	Equipment Location	Ver./Cal. Req?	Ver./Cal. Frequency	Task Description	C-765/EW234 Acceptance Criteria	C-765-A/EW235 Acceptance Criteria	Notes
PI-9	Pressure Gauge	C-765 C-765-A	Yes	Biennially	Shutdown system, bleed pressure, and check for zero shift. Remove pressure gauge for testing if necessary.	Zero shift less than 5 psig.	Zero shift less than 5 psig.	Instrument is NOT required/relied on for process monitoring or data collection through procedure, surveillance, or other performance documents. Instrument provides "Information Only" data. Instrument should be tagged as "Information Only" or with similar wording to indicate data from this instrument is not to be used for data collection or process monitoring. Instrument is not required to be calibrated, but at a minimum should be checked for proper function.
PI-10	Pressure Gauge	C-765 C-765-A	Yes	Biennially	Shutdown system, bleed pressure, and check for zero shift. Remove pressure gauge for testing if necessary.	Zero shift less than 5 psig.	Zero shift less than 5 psig.	Instrument is NOT required/relied on for process monitoring or data collection through procedure, surveillance, or other performance documents. Instrument provides "Information Only" data. Instrument should be tagged as "Information Only" or with similar wording to indicate data from this instrument is not to be used for data collection or process monitoring. Instrument is not required to be calibrated, but at a minimum should be checked for proper function.
PI-11	Pressure Gauge	C-765 C-765-A	Yes	Biennially	Shutdown system, bleed pressure, and check for zero shift. Remove pressure gauge for testing if necessary.	Zero shift less than 5 psig.	Zero shift less than 5 psig.	Instrument is NOT required/relied on for process monitoring or data collection through procedure, surveillance, or other performance documents. Instrument provides "Information Only" data. Instrument should be tagged as "Information Only" or with similar wording to indicate data from this instrument is not to be used for data collection or process monitoring. Instrument is not required to be calibrated, but at a minimum should be checked for proper function.

NEPCS Calibration and Testing Assessment (Continued)

Device Number	Description	Equipment Location	Ver./Cal. Req?	Ver./Cal. Frequency	Task Description	C-765/EW234 Acceptance Criteria	C-765-A/EW235 Acceptance Criteria	Notes
PI-12	Pressure Gauge	C-765 C-765-A	Yes	Biennially	Shutdown system, bleed pressure, and check for zero shift. Remove pressure gauge for testing if necessary.	Zero shift less than 5 psig.	Zero shift less than 5 psig.	Instrument is NOT required/relied on for process monitoring or data collection through procedure, surveillance, or other performance documents. Instrument provides "Information Only" data. Instrument should be tagged as "Information Only" or with similar wording to indicate data from this instrument is not to be used for data collection or process monitoring. Instrument is not required to be calibrated, but at a minimum should be checked for proper function.
PI-13	Pressure Gauge	C-765	Yes	Biennially	Shutdown system, bleed pressure, and check for zero shift. Remove pressure gauge for testing if necessary.	Zero shift less than 5 psig.	N/A	Instrument is NOT required/relied on for process monitoring or data collection through procedure, surveillance, or other performance documents. Instrument provides "Information Only" data. Instrument should be tagged as "Information Only" or with similar wording to indicate data from this instrument is not to be used for data collection or process monitoring. Instrument is not required to be calibrated, but at a minimum should be checked for proper function.
PI-14	Pressure Gauge	C-765	Yes	Biennially	Shutdown system, bleed pressure, and check for zero shift. Remove pressure gauge for testing if necessary.	Zero shift less than 5 psig.	N/A	Instrument is NOT required/relied on for process monitoring or data collection through procedure, surveillance, or other performance documents. Instrument provides "Information Only" data. Instrument should be tagged as "Information Only" or with similar wording to indicate data from this instrument is not to be used for data collection or process monitoring. Instrument is not required to be calibrated, but at a minimum should be checked for proper function.

NEPCS Calibration and Testing Assessment (Continued)

Device Number	Description	Equipment Location	Ver./Cal. Req?	Ver./Cal. Frequency	Task Description	C-765/EW234 Acceptance Criteria	C-765-A/EW235 Acceptance Criteria	Notes
PT-310	Pressure Transducer	C-765 C-765-A	Yes	Annual	Check Calibration	Test Point 1: 0 psig + 3 psi Test Point 2: 50 psig ± 3 psi Test Point 3: 100 psig ± 3 psi Test Point 4: 150 psig ± 3 psi Test Point 5: 190 psig ± 3 psi	Test Point 1: 0 psig + 3 psi Test Point 2: 50 psig ± 3 psi Test Point 3: 100 psig ± 3 psi Test Point 4: 150 psig ± 3 psi Test Point 5: 190 psig ± 3 psi	Read point found on treatment unit HMI.
					Isolate pressure transducer from system and bleed pressure below system alarm trip point.	Obtain alarm on HMI	Obtain alarm on HMI	System alarm trip point is found in the "System set-up" menu on the HMI.
PT-320	Pressure Transducer	C-765 C-765-A	Yes	Annual	Check Calibration	Test Point 1: 0 psig + 3 psi Test Point 2: 50 psig ± 3 psi Test Point 3: 100 psig ± 3 psi Test Point 4: 150 psig ± 3 psi Test Point 5: 190 psig ± 3 psi	Test Point 1: 0 psig + 3 psi Test Point 2: 50 psig ± 3 psi Test Point 3: 100 psig ± 3 psi Test Point 4: 150 psig ± 3 psi Test Point 5: 190 psig ± 3 psi	Read point found on treatment unit HMI.
					Isolate pressure transducer from system and add pressure until system alarm trip point.	Obtain High Pressure alarm on HMI. PLC switches bag filter and indicates dirty filter on HMI.	Obtain High Pressure alarm on HMI. PLC switches bag filter and indicates dirty filter on HMI.	System alarm trip point is found in the "System set-up" menu on the HMI. Differential pressure control across bag filters will change during this task.
PT-330	Pressure Transducer	C-765 C-765-A	Yes	Annual	Check Calibration	Test Point 1: 0 psig + 3 psi Test Point 2: 50 psig ± 3 psi Test Point 3: 100 psig ± 3 psi Test Point 4: 150 psig ± 3 psi Test Point 5: 190 psig ± 3 psi	Test Point 1: 0 psig + 3 psi Test Point 2: 50 psig ± 3 psi Test Point 3: 100 psig ± 3 psi Test Point 4: 150 psig ± 3 psi Test Point 5: 190 psig ± 3 psi	Read point found on treatment unit HMI.
PT-360	Pressure Transducer	C-765 C-765-A	Yes	Annual	Check Calibration	Test Point 1: 0 psig + 3 psi Test Point 2: 50 psig ± 3 psi Test Point 3: 100 psig ± 3 psi Test Point 4: 150 psig ± 3 psi Test Point 5: 190 psig ± 3 psi	Test Point 1: 0 psig + 3 psi Test Point 2: 50 psig ± 3 psi Test Point 3: 100 psig ± 3 psi Test Point 4: 150 psig ± 3 psi Test Point 5: 190 psig ± 3 psi	Read point found on treatment unit HMI.
FIT-320	Treatment Unit Influent Flow Meter	C-765 C-765-A	Yes	Annual	Simulate flow from EW until flow rate is outside system operating range and alarm trip points.	EW shutdown and low/high flow alarm on HMI	EW shutdown and low/high flow alarm on HMI	Cannot be calibrated. Flow rates and totals are collected during daily operations. Flow rates and totals outside of normal operating ranges are an indicator of flow meter/totalizer failure. Flow meter/totalizer will be checked if unusual readings are noted during data collection. Flow meter/totalizer will be replaced if the inspection indicates problems. System alarm trip point is found in the "System set-up" menu on the HMI.

NEPCS Calibration and Testing Assessment (Continued)

Device Number	Description	Equipment Location	Ver./Cal. Req?	Ver./Cal. Frequency	Task Description	C-765/EW234 Acceptance Criteria	C-765-A/EW235 Acceptance Criteria	Notes
FIT-370	Treatment Unit Effluent Flow Meter	C-765 C-765-A	No	N/A	N/A	N/A	N/A	Cannot be calibrated. Flow rates and totals are collected during daily operations. Flow rates and totals outside of normal operating ranges are an indicator of flow meter/totalizer failure. Flow meter/totalizer will be checked if unusual readings are noted during data collection. Flow meter/totalizer will be replaced if the inspection indicates problems.
PSH-340	Pressure Switch	C-765 C-765-A	Yes	Annual	Perform functional verification of switch by verifying switch activation against pressure gauge. Adjust setting as necessary.	Stop B-340 Blower at 30 inWC ±5 inWC and generates alarm on HMI.	Stop B-340 Blower at 30 inWC ±5 inWC and generates alarm on HMI.	Maximum pressure applied to switch shall be less than 35 psig.
PSLL-340	Pressure Switch	C-765 C-765-A	Yes	Annual	Perform functional verification of switch by verifying switch activation against pressure gauge. Adjust setting as necessary.	Stop B-340 Blower at 5 inWC ±2 inWC and generates alarm on HMI.	Stop B-340 Blower at 5 inWC ±2 inWC and generates alarm on HMI.	Maximum pressure applied to switch shall be less than 45 inWC.
DPT-340	Differential Pressure Gauge	C-765 C-765-A	Yes	Annual	Check Calibration	Test Point 1: 0 inWC + 2 inWC Test Point 2: 15 inWC ± 2 inWC Test Point 3: 25 inWC ± 2 inWC Test Point 4: 35 inWC ± 2 inWC Test Point 5: 45 inWC ± 2 inWC	Test Point 1: 0 inWC + 0.5 inWC Test Point 2: 6 inWC ± 1 inWC Test Point 3: 12 inWC ± 1 inWC Test Point 4: 18 inWC ± 1 inWC Test Point 5: 24 inWC ± 1 inWC	C-765: Local Field Instrument only. C-765-A: Read point found on treatment unit HMI and field local instrument. Record both values during calibration check.
DPT-350	Differential Pressure Transmitter	C-765	Yes	Annual	Check Calibration	Test Point 1: 0 inWC + 0.5 inWC Test Point 2: 6 inWC ± 1 inWC Test Point 3: 12 inWC ± 1 inWC Test Point 4: 18 inWC ± 1 inWC Test Point 5: 24 inWC ± 1 inWC	N/A	Read point found on treatment unit HMI and field local instrument. Record both values during calibration check.
LIT-340	Level Indicator	C-765 C-765-A	Yes	Annual	Check Calibration	Test Point 1: 0 inWC + 1 inWC Test Point 2: 24 inWC ± 3 inWC Test Point 3: 48 inWC ± 3 inWC Test Point 4: 72 inWC ± 3 inWC Test Point 5: 96 inWC ± 3 inWC	Test Point 1: 0 inWC + 1 inWC Test Point 2: 24 inWC ± 3 inWC Test Point 3: 48 inWC ± 3 inWC Test Point 4: 72 inWC ± 3 inWC Test Point 5: 96 inWC ± 3 inWC	Read point found on treatment unit HMI.
LSLL-340	Level Switch	C-765 C-765-A	Yes	Annual	Remove water in air stripper sump until LSLL-340 activates.	Shutdown P-340 and obtain alarm on HMI.	Shutdown P-340 and obtain alarm on HMI.	None

NEPCS Calibration and Testing Assessment (Continued)

Device Number	Description	Equipment Location	Ver./Cal. Req?	Ver./Cal. Frequency	Task Description	C-765/EW234 Acceptance Criteria	C-765-A/EW235 Acceptance Criteria	Notes
LSHH-340	Level Switch	C-765 C-765-A	Yes	Annual	Add water in air stripper sump until LSHH-340 activates.	Shuts down EW, obtain alarm on HMI, and receive autodialer callout.	Shuts down EW, obtain alarm on HMI, and receive autodialer callout.	None
LSHH-310	Level Switch	C-765 C-765-A	Yes	Annual	Shutdown treatment unit sump pump and fill sump with water until LSHH-310 activates.	Shuts down EW, obtain alarm on HMI, and receive autodialer callout.	Shuts down EW, obtain alarm on HMI, and receive autodialer callout.	Alarm delay is programmed in the PLC. LSHH-310 will not instantaneously alarm.
EW E-STOP #1	Emergency Stop	EW-234 EW-235	Yes	Annual	Perform functional verification. Push E-stop button.	System shutdown occurs and autodialer callout.	System shutdown occurs and autodialer callout.	None
TU E-STOP #1	Emergency Stop	C-765 C-765-A	Yes	Annual	Perform functional verification. Push E-stop button.	System shutdown occurs and autodialer callout.	System shutdown occurs and autodialer callout.	None
TU E-STOP #2	Emergency Stop	C-765 C-765-A	Yes	Annual	Perform functional verification. Push E-stop button.	System shutdown occurs and autodialer callout.	System shutdown occurs and autodialer callout.	None

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX C

MAINTENANCE TASK FREQUENCY TABLE FOR NWPGS

THIS PAGE INTENTIONALLY LEFT BLANK

Northwest Plume Groundwater System Maintenance Task Frequency			
P&ID	**Item**	**Task**	**Frequency**
G-003	Filter press	Check hydraulic power unit (HPU) relief valve	Quarterly
		Change hydraulic oil (depending on usage)	Annually
J-005	Equalization pump	Grease bearings	Quarterly
		Change oil in bearing housing	Quarterly
		Check foundation and hold down bolts for tightness	Annually
J-006	Air stripper pump	Change oil in bearing housing	Quarterly
		Check foundation and hold down bolts for tightness	Annually
J-008	Backwash pump	Check oil level in sight glass	Monthly
		Check pump and piping for leaks	Quarterly
		Check discharge pressure	Quarterly
		Check foundation and hold down bolts for tightness	Annually
		Check pump for excessive vibration	Annually
		Change oil in bearing housing	Annually
		Grease bearings	Annually
AJ-001	Air stripper blower	Check sump for debris	Quarterly
		Check for buildup on trays	Quarterly
		Grease fan	Quarterly
		Check tightness of bolts and screws	Quarterly
		Check for obstructions to airflow inlet/outlet	Quarterly
		Check fan for excessive vibration/noise	Annually
		Check demister pad	Annually

Northwest Plume Groundwater System Maintenance Task Frequency (Continued)			
P&ID	**Item**	**Task**	**Frequency**
A1-A/ A1-B	Air compressors	Check for buildup on after coolers and fan	Monthly
		Inspect/clean air filter	Monthly
		Change compressor lubricant	Every 10,000 hours of operation
		Change oil filter element	Quarterly
		Replace oil/air separator	Per message panel
		Replace air filter cartridge	Per message panel
A4	Air dryers	Check/replace oil removal filter cartridges	Annually
		Check/replace airline filter cartridges	Annually
		Check/replace purge air filter cartridges	Annually
		Check/replace purge muffler cartridges	Annually
LCV-080	Equalization pump flow valve	Check main valve stem packing	Annually
		Check main valve diaphragm	Annually
AUV-012	Air stripper flow valve	Check main valve stem packing	Annually
		Check main valve diaphragm	Annually
UV-050	System effluent valve	Check main valve stem packing	Annually
		Check main valve diaphragm	Annually
F-001	Equalization tank	Check exterior surface for chips/rust	Annually
F-002	Backwash tank	Check exterior surface for chips/rust	Annually
G-001	Greensand vessel	Check exterior surface for chips/rust	Annually
G-002	Greensand vessel	Check exterior surface for chips/rust	Annually
A	Ion exchange column	Check exterior surface for chips/rust	Annually
		Backwash resin bed	Annually
B	Ion exchange column	Check exterior surface for chips/rust	Annually
		Backwash resin bed	Annually

Northwest Plume Groundwater System Maintenance Task Frequency (Continued)			
P&ID	**Item**	**Task**	**Frequency**
C	Ion exchange column	Check exterior surface for chips/rust	Annually
		Backwash resin bed	Annually
D	Ion exchange column	Check exterior surface for chips/rust	Annually
		Backwash resin bed	Annually
MH-##	Manholes–08-12	Inspect/pump out	Monthly
EW-###	Well Vaults EW232 & EW233	Inspect/pump out	Monthly
N/A	Ventilation Fans	Check/replace belts and grease bearings	Annually

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX D

CALIBRATION AND TESTING ASSESSMENT FOR NWPGS

THIS PAGE INTENTIONALLY LEFT BLANK

Calibration and Testing Assessment for NWPGS

Device Number	Description	Assoc. Skid	Assoc. Skid or Equipment Name	Ver./ Cal. Req?	Ver./Cal Freq.	Verification or Calibration Description	Pass/Fail Criteria	Notes
PI-J010	Pressure Gauge	EW-232	EW-232 Well Vault	Yes	Annual	Check calibration	Test 1—Low point = 10 psi +/- 5 psi Test 2—Oper. point = 30 psi +/- 5 psi Test 3—High point = 60 psi +/- 5 psi	None
PI-J010	Pressure Switch High/Low	EW-232	EW-232 Well Vault	Yes	Annual	Perform functional verification of switch by verifying high and low switch activation against pressure gauge. Adjust settings as necessary.	Test 1—Low point = 10 psi +/- 5 psi; EW-232 shuts down; fault appears on PanelView Test 2—High point = 60 psi +/- 5 psi; EW-232 shuts down; fault appears on PanelView	This also will test for Interlock I-1.
FQI-J010	Flow Meter/ Totalizer	EW-232	EW-232 Well Vault	No	Five Years	N/A	N/A	Cannot be calibrated locally. Flow rates and totals are collected during daily operations. Flow rates and totals outside of normal operating parameters are an indicator of flow meter/totalizer failure. Flow meter/totalizer will be calibrated every five years by the manufacturer.
PI-J011	Pressure Gauge	EW-233	EW-233 Well Vault	Yes	Annual	Check calibration	Test 1—Low point = 10 psi +/- 5 psi Test 2—Oper. point = 30 psi +/- 5 psi Test 3—High point = 60 psi +/- 5 psi	None
PI-J011	Pressure Switch High/Low	EW-233	EW-233 Well Vault	Yes	Annual	Perform functional verification of switch by verifying high and low switch activation against pressure gauge. Adjust	Test 1—Low point = 10 psi +/- 5 psi; EW-233 shuts down; fault appears on PanelView Test 2—High point = 60 psi +/- 5 psi; EW-233 shuts down; fault appears on PanelView	This will also test for Interlock I-1.

Calibration and Testing Assessment for NWPGS (Continued)

Device Number	Description	Assoc. Skid	Assoc. Skid or Equipment Name	Ver./ Cal. Req?	Ver./Cal Freq.	Verification or Calibration Description	Pass/Fail Criteria	Notes
						settings as necessary.		
FQI-J011	Flow Meter/ Totalizer	EW-233	EW-233 Well Vault	No	Five Years	N/A	N/A	Cannot be calibrated locally. Flow rates and totals are collected during daily operations. Flow rates and totals outside of normal operating parameters are an indicator of flow meter/totalizer failure. Flow meter/totalizer will be calibrated every five years by the manufacturer.
LSH-008	Leak Detector Sensor/ Switch	N/A	Manhole L-008	Yes	Biennial	Perform functional verification	Test 1—Leak alarm appears on PanelView when sensor is immersed in water; north and south extraction wells shut down; alarm appears on PanelView; autodialer calls out	Manholes are inspected monthly. If the sensors were malfunctioning it would be noted at this time. This functional verification also tests interlocks I-3 and alarm condition 3.
LSH-009	Leak Detector Sensor/ Switch	N/A	Manhole L-009	Yes	Biennial	Perform functional verification	Test 1—Leak alarm appears on PanelView when sensor is immersed in water; south extraction wells shut down; alarm appears on PanelView; autodialer calls out	Manholes are inspected monthly. If the sensors were malfunctioning it would be noted at this time. This functional verification also tests interlocks I-3 and alarm condition 3.
LSH-010	Leak Detector Sensor/ Switch	N/A	Manhole L-010	Yes	Biennial	Perform functional verification	Test 1—Leak alarm appears on PanelView when sensor is immersed in water; north and south extraction wells shut down; alarm appears on PanelView; autodialer calls out	Manholes are inspected monthly. If the sensors were malfunctioning it would be noted at this time. This functional verification also tests interlocks I-3 and alarm condition 3.
LSH-011	Leak Detector Sensor/ Switch	N/A	Manhole L-011	Yes	Biennial	Perform functional verification	Test 1—Leak alarm appears on PanelView when sensor is immersed in water; north and south extraction wells shut down; alarm appears on PanelView; autodialer calls out	Manholes are inspected monthly. If the sensors were malfunctioning it would be noted at this time. This functional verification also tests interlocks I-3 and alarm condition 3.
LSH-012	Leak Detector Sensor/ Switch	N/A	Manhole L-012	Yes	Biennial	Perform functional verification	Test 1—Leak alarm appears on PanelView when sensor is immersed in water; north and south extraction wells shut down; alarm appears on PanelView; autodialer calls out	Manholes are inspected monthly. If the sensors were malfunctioning it would be noted at this time. This functional verification also tests interlocks I-3 and alarm condition 3.

Calibration and Testing Assessment for NWPGS (Continued)

Device Number	Description	Assoc. Skid	Assoc. Skid or Equipment Name	Ver./ Cal. Req?	Ver./Cal Freq.	Verification or Calibration Description	Pass/Fail Criteria	Notes
LSH-013	Leak Detector Sensor/ Switch	N/A	Manhole L-013	Yes	Biennial	Perform functional verification	Test 1—Leak alarm appears on PanelView when sensor is immersed in water; north and south extraction wells shut down; alarm appears on PanelView; autodialer calls out	Manholes are inspected monthly. If the sensors were malfunctioning it would be noted at this time. This functional verification also tests interlocks I-3 and alarm condition 3.
LSH-014	Leak Detector Sensor/ Switch	N/A	Manhole L-014	Yes	Biennial	Perform functional verification	Test 1—Leak alarm appears on PanelView when sensor is immersed in water; north and south extraction wells shut down; alarm appears on PanelView; autodialer calls out	Manholes are inspected monthly. If the sensors were malfunctioning it would be noted at this time. This functional verification also tests interlocks I-3 and alarm condition 3.
LSH-014	Leak Detector Sensor/ Switch	N/A	Ion Exchange Trailer Sump	Yes	Biennial	Perform functional verification	Test 1—Leak alarm appears on PanelView when sensor is immersed in water; north and south extraction wells shut down; alarm appears on PanelView; autodialer calls out	The sump is inspected monthly. If the sensors were malfunctioning it would be noted at this time. This functional verification also tests interlocks I-3 and alarm condition 3.
LE-F001	Level Probe	F-001	Equalization Tank	Yes	Biennial	Perform calibration	Test 1—Low point = 5% +/- 1% Test 2—High point = 90% +/- 1%	None

Calibration and Testing Assessment for NWPGS (Continued)

Device Number	Description	Assoc. Skid	Assoc. Skid or Equipment Name	Ver./ Cal. Req?	Ver./Cal Freq.	Verification or Calibration Description	Pass/Fail Criteria	Notes
LSL-F001 LSH-F001 LSHH-F001	Level Switch Low, High, and High-High	F-001	Equalization Tank	Yes	Biennial	Perform functional verification. No calibration will be performed unless functional verification indicates it is required.	Test 1a—Low point = 5% +/- 1% and equalization pump J-005 shuts down Test 1b—Equalization pump J-005 restarts when tank raises to 50% +/- 5% Test 2a—Extraction well pump J-003 becomes enabled at 80% +/- 5% Test 2b—Extraction well pump J-002 becomes enabled at 85% +/- 5% Test 2c—Extraction well pumps J-001 and J-004 become enabled at 90% +/- 5% Test 2d—High-high switch activates at 98% +/- 2%, alarm appears on PanelView, and equalization pump J-005 shuts down Test 2 e—Extraction well pumps J-001, J-002, J-003, and J-004 restart at 75% +/-5%	High point no longer needs to be tested as it was tied to interlock I-5 which is no longer in service. Execution of tests 1 and 2 checks interlock I-4 and I-6 respectively.
FI-J005A	Flow Indicator	J-005	Equalization Pump	No	N/A	N/A	N/A	The overall system flow rate is checked daily at the K-100 panel and is compared to the total extraction well production. This flow meter is impractical to test.
PI-J005	Pressure Indicator	J-005	Equalization Pump	Yes	Annual	Check calibration	Test 1—Low point = 30 psi +/- 5 psi Test 2—Oper. point = 60 psi +/- 5 psi Test 3—High point = 90 psi +/- 5 psi	None
FSH-J005 FSL-J005	Flow Switch Low/High	J-005	Equalization Pump	No	N/A	N/A	N/A	The low/high flow switch cannot be simulated without activating other interlocks.
LE-E301	Level Probe	E-001	Air Stripper	Yes	Biennial	Perform calibration	Test 1—Low point = 0% +/- 1% Test 2—High point = 100% +/- 1%	None

Calibration and Testing Assessment for NWPGS (Continued)

Device Number	Description	Assoc. Skid	Assoc. Skid or Equipment Name	Ver./ Cal. Req?	Ver./Cal Freq.	Verification or Calibration Description	Pass/Fail Criteria	Notes
PDIS-E301	Pressure Differential Gauge	E-001	Air Stripper	Yes	Annual	Perform 2-point calibration	Test 1—Verify/adjust to 0 inches H_2O Test 2—High point = 14 in H_2O +/- 2 inches H_2O	None
LSL-E301 LSH-E301	Level Switch Low and High	E-001	Air Stripper	Yes	Annual	Perform functional verification. No calibration will be performed unless functional verification indicates it is required.	Test 1—Alarm appears on PanelView when sump level = 5% +/- 1% (low level) Test 2—Alarm appears on PanelView when sump level = 95% +/- 5% (high level)	Execution of tests 1 and 2 checks interlocks I-18 and I-19, respectively.
TI-301A	Temperature Probe	E-001	Air Stripper	No	N/A	N/A	N/A	This temperature probe is for information purposes and does not serve a critical operational function.
FI-301	Flow Indicator	E-001	Air Stripper	Yes	Biennial	Calibrate flow meter	Test 1—Oper. point = 0.29 inches H_2O +/- 0.02 inches H_2O	Only a one-point calibration is practical due to the low pressure range of the gauge.
TI-301B	Temperature Probe	J-006	Air Stripper Pump	No	N/A	N/A	N/A	This temperature probe is for information purposes and does not serve a critical operational function.
PI-J306	Pressure Gauge	J-006	Air Stripper Pump	Yes	Annual	Check calibration	Test 1—Low point = 30 psi +/- 4 psi Test 2—Oper. point = 60 psi +/- 4 psi Test 3—High point = 90 psi +/- 4 psi	None
PI-AJ301	Pressure Indicator	AC-001	Air Stripper Blower	Yes	Annual	Check calibration	Test 1—Verify/adjust to 0 inches H_2O Test 2—High point = 28 inches H_2O +/- 2 inches H_2O	None

Calibration and Testing Assessment for NWPGS (Continued)

Device Number	Description	Assoc. Skid	Assoc. Skid or Equipment Name	Ver./ Cal. Req?	Ver./Cal Freq.	Verification or Calibration Description	Pass/Fail Criteria	Notes
PSL-AJ301 PSH-AJ301	Pressure Switch High/Low	AC-001	Air Stripper Blower	Yes	Annual	Perform functional verification. No calibration will be performed unless functional verification indicates it is required.	Test 1—System shuts down when blower discharge pressure (low pressure) = 8 inches H_2O +/- 1 inches H_2O; Alarm appears on PanelView. Test 2—System shuts down when blower discharge pressure (high pressure) = 36 inches H_2O +/- 3 inches H_2O; Alarm appears on PanelView.	Execution of tests 1 and 2 checks interlock I-12.
TE-AC301	Temperature Probe	AC-001	Air Stripper Heater	Yes	Biennial	Check calibration	N/A	Temperature element is not practical to test as this would require system shutdown and complete removal of the element. Testing will be performed if values are outside the acceptable range.
LE-F002	Level Probe	F-002	Backwash Sluice Tank	No	N/A	N/A	N/A	Due to personnel safety concerns with accessing the tank, and continued testing on the alarms points for this vessels, this test was removed.
LSLL-F002 LSH-F002 LSL-F002 LSHH-F002	Level Switch High-High, High, Low, and Low-Low	F-002	Backwash Sluice Tank	Yes	Annual	Perform functional verification. No calibration will be performed unless functional verification indicates it is required.	Test 1—Backwash pump J-008 stops when the backwash tank level reaches 5% +/- 2% (low-low switch). Test 2a—UV-50 opens and UV-110 closes when the backwash tank reaches 90% +/- 2% (high switch). Test 2b—UV-050 closes and UV-110 opens when the backwash tank reaches 80% +/- 2% (low switch). Test 3—System shutdown occurs when the backwash tank reaches 98% +/- 2% (high-high switch); Alarm appears on PanelView.	Execution of tests 1, 2, and 3 checks interlocks I-23, I-25, and I-26, respectively.

Calibration and Testing Assessment for NWPGS (Continued)

Device Number	Description	Assoc. Skid	Assoc. Skid or Equipment Name	Ver./ Cal. Req?	Ver./Cal Freq.	Verification or Calibration Description	Pass/Fail Criteria	Notes
PI-J008	Pressure Gauge	J-008	Backwash/ Sluice Pump	Yes	Annual	Check calibration	Test 1—Low point = 15 psi +/- 3 psi Test 2—Oper. Point = 30 psi +/- 3 psi Test 3—High point = 45 psi +/- 3 psi	None
PI-GPG001	Pressure Gauge	G-002	Sand Filter	Yes	Annual	Check calibration	Test 1—Low point = 20 psi +/- 3 psi Test 2—Oper. Point = 40 psi +/- 3 psi Test 3—High point = 60 psi +/- 3 psi	None
PI-GPG002	Pressure Gauge	G-002	Sand Filter	Yes	Annual	Check calibration	Test 1—Low point = 20 psi +/- 3 psi Test 2—Oper. Point = 40 psi +/- 3 psi Test 3—High point = 60 psi +/- 3 psi	None
GSRV-026	Pressure Safety Relief Valve	G-002	Sand Filter	No	N/A	N/A	N/A	Safety relief valves will be changed upon media replacement.
PI-GPG003	Pressure Gauge	G-002	Sand Filter	Yes	Annual	Check calibration	Test 1—Low point = 20 psi +/- 3 psi Test 2—Oper. point = 40 psi +/- 3 psi Test 3—High point = 60 psi +/- 3 psi	None
PI-GPG004	Pressure Gauge	G-002	Sand Filter	Yes	Annual	Check calibration	Test 1—Low point = 20 psi +/- 3 psi Test 2—Oper. point = 40 psi +/- 3 psi Test 3—High point = 60 psi +/- 3 psi	None
GSRV-025	Pressure Safety Relief Valve	G-002	Sand Filter	No	N/A	N/A	N/A	Safety relief valves will be changed upon media replacement.
PI-G003	Pressure Gauge	G-003	Filter Press	Yes	Annual	Replace gauge	N/A	High-pressure gauge cannot be tested. The gauge will be replaced annually with a factory-calibrated gauge.
LE-J016	Level Probe	J-016	Treatment System Sump	No	N/A	N/A	N/A	Level probe functionality and accuracy is checked when testing the treatment system sump level switches.
LSL-J016 LSH-J016 LSHH-J016	Level Switch Low, High, High-High	J-016	Treatment System Sump	Yes	Annual	Perform functional verification. No	Test 1—Sump pump J-016 starts on sump level = 16 inches +/- 2 inches (low level switch).	Execution of tests 1, 2, and 3 checks interlocks I-39, I-40, and I-41,

Calibration and Testing Assessment for NWPGS (Continued)

Device Number	Description	Assoc. Skid	Assoc. Skid or Equipment Name	Ver./ Cal. Req?	Ver./Cal Freq.	Verification or Calibration Description	Pass/Fail Criteria	Notes
						calibration will be performed unless functional verification indicates it is required.	Test 2—Sump pump J-016 stops on sump level = 5 inches +/- 2 inches (high level switch). Test 3—System shuts down when sump level = 21 inches +/- 2 inches (high-high level switch); Alarm appears on PanelView; autodialer calls out.	respectively; Test 3 is performed quarterly to check alarm condition 2.
LE-F008	Level Probe	F-008	Settling Tank	No	N/A	N/A	N/A	Due to personnel safety concerns with accessing the tank, and continued testing on the alarms points for this vessels, this test was removed.
LSL-F008 LSH-F008 LSHH-F008	Level Switch Low, High, and High-High	F-008	Settling Tank	Yes	Annual	Perform functional verification. No calibration will be performed unless functional verification indicates it is required.	Test 1—Backwash pump J-008 stops when settling tank level = 95% +/- 2% (high-high level switch); Alarm appears on PanelView.	Level switch LSL-F008 does not require testing since automatic valve UV-107 is not used in automatic mode. LSH-F008 is tied to Interlock I-42 which is no longer in service; therefore it will not be tested. Execution of tests 1, 2, and 3 checks interlocks I-36, I-37, and I-38 respectively.
PI-J012C	Pressure Indicator	J-012	Air Compressor Skid	Yes	Annual	Check calibration	Test 1—Low point = 50 psi +/- 6 psi Test 2—Oper. point = 100 psi +/- 4 psi Test 3—High point = 150 psi +/- 6 psi	None
PSV-A6	Pressure Safety Valve	J-012	Air Compressor Skid	Yes	Annual	Perform functional verification	Relief valve activates easily when pulled	None
PI-R001	Pressure Gauge	J-012	Air Compressor Skid	No	N/A	N/A	N/A	Routine testing not recommended by manufacturer.

Calibration and Testing Assessment for NWPGS (Continued)

Device Number	Description	Assoc. Skid	Assoc. Skid or Equipment Name	Ver./ Cal. Req?	Ver./Cal Freq.	Verification or Calibration Description	Pass/Fail Criteria	Notes
PI-R002	Pressure Gauge	J-012	Air Compressor Skid	No	N/A	N/A	N/A	Routine testing not recommended by manufacturer.
I-1	Interlock–Stop well pump upon high or low pressure			Yes	Annual	Perform functional verification	Refer to the pass/fail criteria listed for PSH/L-J003, PSH/L-J004, PSH/L-J010, PSH/L-J011.	This interlock is tested when PSH/L-J001, PSH/L-J002, PSH/L-J003, and PSH/L-J004 are verified functionally.
I-2	Interlock–Stop well pump upon system shutdown			No	N/A	NOT IN SERVICE	N/A	Interlock has multiple triggers, verification for this interlock is covered by other interlock testing.
I-3	Interlock–Stop well pump upon leak detection			Yes	Biennial	Perform functional verification	Refer to the pass/fail criteria presented for LSH-008 through LSH-012.	This interlock is tested when LSH-008, LSH-009, LSH-010, LSH-011, and LSH-012 functional tests are performed.
I-4	Interlock–System shutdown upon low level			Yes	Biennial	Perform functional verification	Refer to pass/fail criteria presented for LSL/LSH/LSHH-F001.	This interlock is tested when LSL/LSH/LSHH-F001 functional tests are performed.
I-5	Interlock–Stop truck unloading pump and turn on high level indicator light at mobile tank unloading station upon high level			No	N/A	NOT IN SERVICE	N/A	Truck unloading pump is not in the system.
I-6	Interlock–System shutdown			Yes	Biennial	Perform functional verification	Refer to pass/fail criteria presented for LSL/LSH/LSHH-F001.	This interlock is tested when LSL/LSH/LSHH-F001 functional tests are performed.

Calibration and Testing Assessment for NWPGS (Continued)

Device Number	Description	Assoc. Skid	Assoc. Skid or Equipment Name	Ver./ Cal. Req?	Ver./Cal Freq.	Verification or Calibration Description	Pass/Fail Criteria	Notes
	upon high-high level							
I-7	Interlock–Stop acid metering pump upon system shutdown			No	N/A	NOT IN SERVICE	N/A	Acid metering pump is not in the system.
I-8	Interlock–Stop acid metering pump upon low pH			No	N/A	NOT IN SERVICE	N/A	Acid metering pump is not in the system.
I-9	Interlock–Stop acid metering pump upon low flow			No	N/A	NOT IN SERVICE	N/A	Acid metering pump is not in the system.
I-10	Interlock–Stop equalization pump upon system shutdown			Yes	Biennial	Perform functional verification	Test 1—Equalization tank pump J-005 stops on system shutdown; alarm appears on PanelView; autodialer calls out.	Execution of this interlock test checks alarm condition 1.
I-11	Interlock–Stop air stripper blower upon system emergency shutdown			Yes	Biennial	Perform functional verification	Test 1—Air stripper blower AJ-001 shuts down after 60 sec +/- 10 sec after air stripper pump J-006 stops.	None
I-12	Interlock–System shutdown upon high or low pressure			Yes	Annual	Perform functional verification	Refer to pass/fail criteria presented for PSH/PSL-AJ301.	This interlock is tested when PSH/PSL functional tests are performed.
I-13	Interlock–System shutdown			Yes	Biennial	Perform functional verification	Refer to pass/fail criteria presented for TSH-AJ301.	This interlock is tested when TSH-AJ301 tests are performed.

Calibration and Testing Assessment for NWPGS (Continued)

Device Number	Description	Assoc. Skid	Assoc. Skid or Equipment Name	Ver./ Cal. Req?	Ver./Cal Freq.	Verification or Calibration Description	Pass/Fail Criteria	Notes
	upon high temperature							
I-14	Interlock–System shutdown upon high temperature			Yes	Biennial	Perform functional verification	Refer to pass/fail criteria presented for TSH-AC301.	This interlock is tested when TSH-AC301 tests are performed.
I-15	Interlock–System shutdown upon low temperature			Yes	Biennial	Perform functional verification	Refer to pass/fail criteria presented for TSL-AC301.	This interlock is tested when TSL-AC301 tests are performed.
I-16	Interlock–Disconnect heater power upon system shutdown			Yes	Biennial	Perform functional verification	Test 1—Air stripper heater AC-001 and air stripper blower AJ-001 shut down 60 sec +/- 6 sec after air stripper pump J-006 shuts down. Verify air stripper heater shuts off with air stripper blower.	None
I-17	Interlock–Stop air stripper pump upon system emergency shutdown			Yes	Biennial	Perform functional verification	Test 1—Upon system shutdown, the air stripper pump J-006 shuts down when the air stripper sump level (LE-E301) reaches 10% +/- 2%.	None
I-18	Interlock–System shutdown upon high level			Yes	Biennial	Perform functional verification	Refer to pass/fail criteria presented for LSH-E301.	This interlock is tested when LSH-E301 tests are performed.
I-19	Interlock–System shutdown upon low level			Yes	Biennial	Perform functional verification	Refer to pass/fail criteria presented for LSL-E301.	This interlock is tested when LSL-E301 tests are performed.

Calibration and Testing Assessment for NWPGS (Continued)

Device Number	Description	Assoc. Skid	Assoc. Skid or Equipment Name	Ver./ Cal. Req?	Ver./Cal Freq.	Verification or Calibration Description	Pass/Fail Criteria	Notes
I-20	Interlock–Stop air stripper pump upon low level in air stripper sump and begin 60 second countdown to lower stop			Yes	Biennial	Perform functional verification	Test 1—During the course of a system shutdown, the air stripper pump J-006 shuts down when the air stripper sump level reaches 10% +/- 2%.	None
I-21	Interlock–Stop Backwash/ sluice pump upon high level in resin dewatering tank			No	N/A	NOT IN SERVICE	N/A	Resin dewatering tank removed from service.
I-22	Interlock–System shutdown upon high-high level in resin dewatering tank			No	N/A	NOT IN SERVICE	N/A	Resin dewatering tank removed from service.
I-23	Interlock–Stop backwash/ sluice pump upon low-low level in backwash/ sluice tank			Yes	Annual	Perform functional verification	Refer to pass/fail criteria presented for LSLL/LSL/LSH/LSHH-F002.	This interlock is tested when LSLL/LSL/LSH/LSHH-F002 tests are performed.
I-24	Interlock–Close UV-050, open			Yes	Annual	Perform functional verification	Refer to pass/fail criteria presented for LSLL/LSL/LSH/LSHH-F002	This interlock is tested when LSLL/LSL/LSH/LSHH-F002 tests are performed.

Calibration and Testing Assessment for NWPGS (Continued)

Device Number	Description	Assoc. Skid	Assoc. Skid or Equipment Name	Ver./ Cal. Req?	Ver./Cal Freq.	Verification or Calibration Description	Pass/Fail Criteria	Notes
	UV-110 upon low level in backwash/ sluice tank							
I-25	Interlock– Open UV-050, Close UV-110 upon high level in backwash/ sluice tank			Yes	Annual	Perform functional verification	Refer to pass/fail criteria presented for LSLL/LSL/LSH/LSHH-F002.	This interlock is tested when LSLL/LSL/LSH/LSHH-F002 tests are performed.
I-26	Interlock– System shutdown upon high level in backwash/ sluice tank			Yes	Annual	Perform functional verification	Refer to pass/fail criteria presented for LSLL/LSL/LSH/LSHH-F002.	This interlock is tested when LSLL/LSL/LSH/LSHH-F002 tests are performed.
I-27	Interlock– Close UV-050 upon system shutdown			Yes	Biennial	Perform functional verification	Test 1—Upon system shutdown, UV-050 and UV-110 close.	None
I-28	Interlock– System shutdown upon high flow			Yes	Biennial	Perform functional verification	Refer to pass/fail criteria presented for FSL/FSH-J005.	This interlock is tested when FSL/FSH-J005 are activated.
I-29	Interlock– System shutdown upon low flow			Yes	Biennial	Perform functional verification	Refer to pass/fail criteria presented for FSL/FSH-J005.	This interlock is tested when FSL/FSH-J005 are activated.
I-30	Interlock–Stop potassium permanganate metering			No	N/A	NOT IN SERVICE	N/A	Potassium permanganate pump is not in the system.

Calibration and Testing Assessment for NWPGS (Continued)

Device Number	Description	Assoc. Skid	Assoc. Skid or Equipment Name	Ver./ Cal. Req?	Ver./Cal Freq.	Verification or Calibration Description	Pass/Fail Criteria	Notes
	pump upon color monitor high							
I-31	Interlock–Stop Sodium hypochlorite metering pump upon ORP monitor high			No	N/A	NOT IN SERVICE	N/A	Sodium hypochlorite pump is not in the system.
I-32	Interlock–Start polymer pump when flow detected top polymer pump upon loss of flow			No	N/A	NOT IN SERVICE	N/A	Polymer pump is not in the system.
I-33	Interlock–V6 closed, V5 open, V8 closed, V10 open start backwash/ sluice pump upon high DP across G002			No	N/A	NOT IN SERVICE	N/A	Sand Filter Skid is not run in automatic mode, all backwash cycles are done in timed mode initiated by the operator.
I-34	Interlock–V3 closed, V4 Open, V7 Closed, V9 open start backwash/ sluice pump upon high DP across G001			No	N/A	NOT IN SERVICE	N/A	Sand Filter Skid is not run in automatic mode, all backwash cycles are done in timed mode initiated by the operator.

Calibration and Testing Assessment for NWPGS (Continued)

Device Number	Description	Assoc. Skid	Assoc. Skid or Equipment Name	Ver./ Cal. Req?	Ver./Cal Freq.	Verification or Calibration Description	Pass/Fail Criteria	Notes
I-35	Interlock–V3, V7, V6, V8 Interlocked such that only one filter backwashes at a time			No	N/A	NOT IN SERVICE	N/A	Sand Filter Skid is not run in automatic mode, all backwash cycles are done in timed mode initiated by the operator.
I-36	Interlock–Close valve UV-107 upon settling tank low level			Yes	Annual	Perform functional verification	Refer to pass/fail criteria presented for LSL/LSH/LSHH/LSHHH-F008.	This interlock is tested when LSL/LSH/LSHH/LSHHH-F008 tests are performed.
I-37	Interlock–Stop backwash/ sluice pump and sump pump upon high level in settling tank			Yes	Annual	Perform functional verification	Refer to pass/fail criteria presented for LSL/LSH/LSHH/LSHHH-F008.	This interlock is tested when LSL/LSH/LSHH/LSHHH-F008 tests are performed.
I-38	Interlock–System shutdown upon high-high level in settling tank			Yes	Annual	Perform functional verification	Refer to pass/fail criteria presented for LSL/LSH/LSHH/LSHHH-F008.	This interlock is tested when LSL/LSH/LSHH/LSHHH-F008 tests are performed.
I-39	Interlock–Stop sump pump upon low level			Yes	Annual	Perform functional verification	Refer to pass/fail criteria presented for LSL/LSH/LSHH-J016.	This interlock is tested when LSL/LSH/LSHH-J016 tests are performed.
I-40	Interlock–Start sump pump upon high level			Yes	Annual	Perform functional verification	Refer to pass/fail criteria presented for LSL/LSH/LSHH-J016.	This interlock is tested when LSL/LSH/LSHH-J016 tests are performed.
I-41	Interlock–System shutdown			Yes	Annual	Perform functional verification	Refer to pass/fail criteria presented for LSL/LSH/LSHH-J016.	This interlock is tested when LSL/LSH/LSHH-J016 tests are performed.

Calibration and Testing Assessment for NWPGS (Continued)

Device Number	Description	Assoc. Skid	Assoc. Skid or Equipment Name	Ver./ Cal. Req?	Ver./Cal Freq.	Verification or Calibration Description	Pass/Fail Criteria	Notes
	upon high-high level in sump							
I-42	Interlock–Open valve UV-107 after timed cycle			No	N/A	NOT IN SERVICE	N/A	Taken out of service since UV-107 is not kept in auto position.
I-43	Interlock–Valve UV-107 closed when truck unloading pump is operating			Yes	Biennial	Perform functional verification	Test 1—Valve UV-107 is closed when the truck unloading pump J-014 is operating.	None
I-44	Interlock–Stop acid metering pump upon high pressure			No	N/A	NOT IN SERVICE	N/A	Acid metering pump is not in the system.
I-45	Interlock–Stop backwash/ sluice pump upon system shutdown			Yes	Biennial	Perform functional verification	Test 1—Upon system shutdown, the backwash pump J-008 stops.	None
I-46	Interlock–Stop sodium hypochlorite metering pump upon high pressure			No	N/A	NOT IN SERVICE	N/A	Sodium hypochlorite metering pump is not in the system.
I-47	Interlock–Stop potassium permanganate pump upon high pressure			No	N/A	NOT IN SERVICE	N/A	Potassium permanganate pump is not in the system.

Calibration and Testing Assessment for NWPGS (Continued)

Device Number	Description	Assoc. Skid	Assoc. Skid or Equipment Name	Ver./ Cal. Req?	Ver./Cal Freq.	Verification or Calibration Description	Pass/Fail Criteria	Notes
I-48	Interlock–Stop polymer pump upon high pressure			No	N/A	NOT IN SERVICE	N/A	Polymer pump is not in the system.
I-49	Interlock–Stop backwash/ sluice pump after timed cycle when backwashing greensand filters			No	N/A	NOT IN SERVICE	N/A	Backwash system is not run automatic mode. System is manually activated and pump is initiated and stopped by the operator.
I-50	Interlock–Start air stripper blower automatically after equalization pump starts			Yes	Biennial	Perform functional verification	Test 1—Upon operation of equalization tank pump J-005, the air stripper blower AJ-001 and air stripper heater AC-001 start running.	None
A-1	Alarm Condition 1			Yes	Quarterly	Perform functional verification	Test 1—Upon system shutdown, the autodialer calls out.	None
A-2	Alarm Condition 2			Yes	Quarterly	Perform functional verification	Test 1—System shuts down when sump level = 21 in +/- 2 in (high-high level switch); Alarm appears on PanelView; autodialer calls out.	Execution of LSHH-J016 test checks this alarm condition.
A-3	Alarm Condition 3			Yes	Quarterly	Perform functional verification	Refer to pass/fail criteria presented for LSH-001 through LSH-009.	Execution of LSH-001 through LSH-009 tests checks this alarm condition.
A-4	Alarm Condition 4			Yes	Semi-annual	Perform functional verification	Test 1—When online analyzer reads effluent > 25 ppb TCE, alarm appears on PanelView; autodialer calls out.	None

Calibration and Testing Assessment for NWPGS (Continued)

Device Number	Description	Assoc. Skid	Assoc. Skid or Equipment Name	Ver./ Cal. Req?	Ver./Cal Freq.	Verification or Calibration Description	Pass/Fail Criteria	Notes
PI-J005	Pressure Indicator	J-005	Equalization Pump	Yes	Annual	Check calibration	Test 1—Low point = 30 psi +/- 5 psi Test 2—Oper. point = 60 psi +/- 5 psi Test 3—High point = 90 psi +/- 5 psi	None